PATENT ABSTRACTS OF JAPAN

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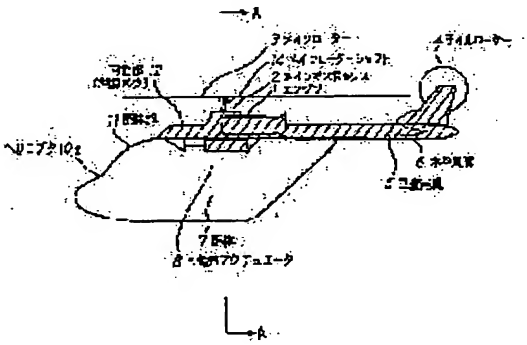
(54) CENTER OF GRAVITY MOVABLE TYPE HELICOPTER

(57)Abstract:
PURPOSE: To offer a center of gravity moving type helicopter capable of making the center of gravity movable and constantly positioning the center of gravity on the main rotor shaft line.
CONSTITUTION: A center of gravity movable type helicopter is constructed by equipping it with an airframe composed of a body unit 11 and a movable unit 12 mutually divided in a relatively movable manner in the longitudinal direction, a movable means for causing the body 11 and the movable part 12 to make a relative movement and a main rotor 3 and a tail rotor 4 provided with certain distances kept from the movable part.



LEGAL STATUS

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CLAIMS

[Claim(s)]
[Claim 1] The center-of-gravity portable type HEL characterized by coming to provide a movable means to make the airframe which consists of idiosoma by which mutual was divided into the cross direction possible [relative displacement], and moving part, and idiosoma and moving part displaced relatively, the main rotor which maintained fixed spacing at moving part and was prepared for it, and a tail rotor.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the HEL which can change a center of gravity easily (migration).
[0002]
[Description of the Prior Art] An example of FURI **** of the force of the conventional HEL is shown in drawing 5 and drawing 6 . Drawing 5 is a left side view at the time of hovering, it intersects perpendicularly to the Maine rotor shaft 14 of a vertical condition mostly, and is rotating horizontally, therefore a main rotor 3 also has HEL 10 in a horizontal position mostly.
[0003] Drawing 6 is a left side view at the time of an advance flight, in order to acquire the component of a force of an advance flight, it inclines ahead, therefore the medial axis (perpendicular to surface of revolution) of rotation of a main rotor 3 also inclines like the broken line of drawing, and the main rotor 3 serves as the Maine rotor shaft 14 and a form crossing diagonally. Since a rotational medial-axis line passes along back from a center of gravity, the head lowering moment arose in the circumference of a center of gravity, and HEL 10 (airframe) also leans to the head lowering condition. In order to negate this moment, a horizontal tail plane 6 is steered, downward lift is produced, and the moment of head raising is generated to a center of gravity. When summarizing, the conventional HEL had the description of following A - KI.
**. It is most desirable for the center-of-gravity location at the time of hovering to come by the conventional HEL on the production of the Maine rotor shaft shaft. (Refer to drawing 5)
**. However, there is center-of-gravity location tolerance, and when it is this within the limits, correspond the gap of a center-of-gravity location by controlling the SAIKU rucksack pitch of a main rotor.
**. The conventional HEL cannot be hovered when a center-of-gravity location moves out of this center-of-gravity location tolerance.
**. Next, fundamentally, a center-of-gravity location comes by the conventional HEL on the production of the Maine rotor shaft shaft at the time of an advance flight. (Refer to drawing 6)
**. However, the vector and the Maine rotor shaft axis of the force which are generated by the main rotor are not in agreement, consequently the head lowering moment produces them by conventional HEL.
**. In order to negate this head lowering moment, by conventional HEL, the head raising moment is produced by making a horizontal tail plane generate downward lift.
**. Generally, even if it is during horizontal flight, by conventional HEL, a fuselage does not become level.
[0004]
[Problem(s) to be Solved by the Invention] There is a trouble of following A which should be solved - U in the above-mentioned conventional HEL.
**. Since center-of-gravity migration tolerance is narrow, employment from which a center-of-gravity location changes sharply cannot be performed.
**. An airframe always cannot be kept level during a flight.
**. During an advance flight, in order to resist the head lowering moment resulting from the center-of-gravity location having shifted from on the Maine rotor shaft axis, the head raising moment (downward lift) must be raw-suggested by the horizontal tail plane.
[0005] the center-of-gravity migration whose this invention solved the above-mentioned trouble -- it is easy and aims at offering the center-of-gravity portable type HEL which can keep an airframe level also in a flight.
[0006]
[Means for Solving the Problem] This invention tends to offer the center-of-gravity portable type HEL by which mutual is characterized by coming to provide a movable means to make the airframe which consists of idiosoma divided into the cross direction possible [relative displacement], and moving part, and idiosoma and moving part displaced relatively, the main rotor which maintained fixed spacing at moving part and was prepared, and a tail rotor as a solution means of the above-mentioned technical problem.
[0007]
[Function] Since this invention is constituted as mentioned above, it has the next operation.

[0008] That is, since it has a movable means to have the airframe which consists of idiosoma divided into the cross direction possible [relative displacement], and moving part, and to make idiosoma and moving part displaced relatively, idiosoma and moving part can be displaced relatively with a movable means, and the center of gravity of a HEL can be moved to the optimal location for employment. Moreover, thereby, center-of-gravity location tolerance is expanded greatly.
[0009] Since pitch actuation of a main rotor etc. does not need to perform migration of this center of gravity like before, it is not necessary to lean an airframe. Moreover, a center-of-gravity location can be changed conversely and an airframe posture can also be changed.
[0010] Moreover, since a main rotor and a tail rotor maintain fixed spacing and are prepared for moving part, they do not need special modification for the actuation relation between a main rotor and a tail rotor.
[0011]
[Example] Drawing 1 - drawing 4 explain one example of this invention. in addition, a same sign is given to the same configuration member as the conventional example, and required for it -- explanation is omitted except for a certain case.
[0012] Drawing and drawing 4 which showed in comparison the condition (the following figure) that drawing 1 made it change with the condition (above figure) that the left side view of the center-of-gravity portable type HEL of this example and drawing 2 change the A-A view sectional view of drawing 1 , and drawing 3 does not change the center-of-gravity location of this example, with the side elevation at the time of hovering are a side elevation explaining the center-of-gravity migration at the time of the advance flight of this example.
[0013] A slash is given in the idiosoma which 11 becomes mainly from fuselage 7 grade, and the moving part which 12 can move to a cross direction relatively to idiosoma 11, and drawing 1 is shown.
[0014] An engine 1, the MEINGIA box 2, a main rotor 3, the tail rotor 4, the vertical tail plane 5, the horizontal tail plane 6, and the Maine rotor shaft 14 are contained in moving part 12.
[0015] 8 is an actuator for movable for moving idiosoma 11 and moving part 12 relatively, one edge is connected with idiosoma 11 and the other end is connected with moving part 12.
[0016] The sliding section 13 which built the ball etc. into the sliding section of idiosoma 11 and moving part 12 as shown in drawing 2 R> 2, and made frictional resistance small by rolling friction is formed. In addition, although the movement magnitude ahead of [to idiosoma 11] moving part 12 is small in viewing in drawing 1 , are large enough in fact, therefore let center-of-gravity migration ahead be sufficient thing to attain the purpose of an example. The same is said of the setback.
[0017] Next, an operation of the above-mentioned configuration is explained.
[0018] Drawing 3 explains a hovering condition first.
[0019] In drawing, HEL 10a of the upper drawing has a center of gravity in the location of an ordinary state, and since it is in agreement with the medial axis of the axis of the Maine rotor shaft 14, and the surface of revolution of a main rotor 3 and they are on a center of gravity, the fuselage 7 is maintaining the horizontal.
[0020] However, in HEL 10a of lower drawing, big staff / cargo 9 of weight and ** will be carried in the posterior part in a fuselage 7, it will compare with the upper drawing, and a center of gravity will move back. Since the head raising moment strong against HEL 10a occurs the way things stand, the actuator 8 for movable is operated, moving part 12 is moved back, and the axis of the Maine rotor shaft 14 is moved on a center of gravity. That is, the vector line of the force which a main rotor 3 produces is made in agreement. Then, as shown in drawing, HEL 10a can maintain a horizontal and can perform normal hovering.
[0021] Next, as shown in drawing 4 at the time of an advance flight, a center-of-gravity location moves moving part 12 ahead so that it may come on the vector line of the force which a main rotor produces.
[0022] Consequently, in a Prior art, the head raising moment by the horizontal tail plane 6 which was a necessary evil becomes unnecessary. That is, the downward lift by the horizontal tail plane 6 becomes unnecessary. A horizontal tail plane can be miniaturized in connection with this. Moreover, since a center-of-gravity location is on the vector line of the force which a main rotor 3 produces, it becomes possible to level a fuselage 7 or to lean it only by making a horizontal tail plane 6 produce slight lift.
[0023] In addition, it is what was shown in the form which the center of gravity moved relatively in order to show the result of having moved moving part 12 ahead so that it might be located on the vector line of the force in which a main rotor 3 produces [a center of gravity] drawing 4 in ****, it ****s in fact for moving part 12 to have moved to the front, and moves from the center of gravity of an airframe to ** and the front.
[0024] Since HEL 10a is divided into idiosoma 11 and moving part 12 and it enabled it to be displaced relatively to a cross direction using the actuator 8 for movable as above according to this example, the large area of a cross direction is covered, it can move in a center of gravity, and the advantage that a center-of-gravity location can always be held is on the vector line of the force which a main rotor 3 produces.
[0025] Consequently, there is an advantage that an airframe can always be kept level during a flight.
[0026] Moreover, since a center-of-gravity location can be placed on Maine rotor shaft 14 axis, there is an advantage of not needing actuation of the head lowering moment not occurring like before, therefore producing

he head raising moment by the horizontal tail plane 6 during an advance flight.
0027] Moreover, since the head raising moment by the horizontal tail plane 6 is not needed, a horizontal tail
lane 6 can be miniaturized and there is an advantage that weight mitigation, machining easy-ization, etc. can be
chieved.
0028]
Effect of the Invention] Since this invention is constituted as mentioned above, it has effectiveness like
ollowing A - E.
**. Since a center-of-gravity location can be changed freely, in the former, it can fly safely also to an impossible
arge center-of-gravity location change.
**. The posture of the airframe under flight can be kept level.
**. A center-of-gravity location can be changed and an airframe posture can be changed.
**. The miniaturization of a horizontal tail plane is attained.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The left side view of the center-of-gravity portable type HEL concerning one example of this invention,
[Drawing 2] The A-A view sectional view of drawing 1 ,
[Drawing 3] Drawing having shown in comparison the condition (above figure) of not changing the center-of-gravity location of the above-mentioned example, and the condition (the following figure) of having made it changing to back, by the left side view at the time of hovering,
[Drawing 4] The left side view explaining the center-of-gravity migration at the time of the advance flight of the above-mentioned example,
[Drawing 5] The left side view at the time of hovering of the conventional HEL,
[Drawing 6] It is a left side view at the time of the advance flight of the conventional HEL.
[Description of Notations]
1 Engine
2 MEINGIA Box
3 Main Rotor
4 Tail Rotor
5 Vertical Tail Plane
6 Horizontal Tail Plane
7 Fuselage
8 Actuator for Movable
9 Staff/Cargo
10a HEL
11 Idiosoma
12 Moving Part
13 Sliding Section
14 Maine Rotor Shaft

[Translation done.]

* NOTICES *

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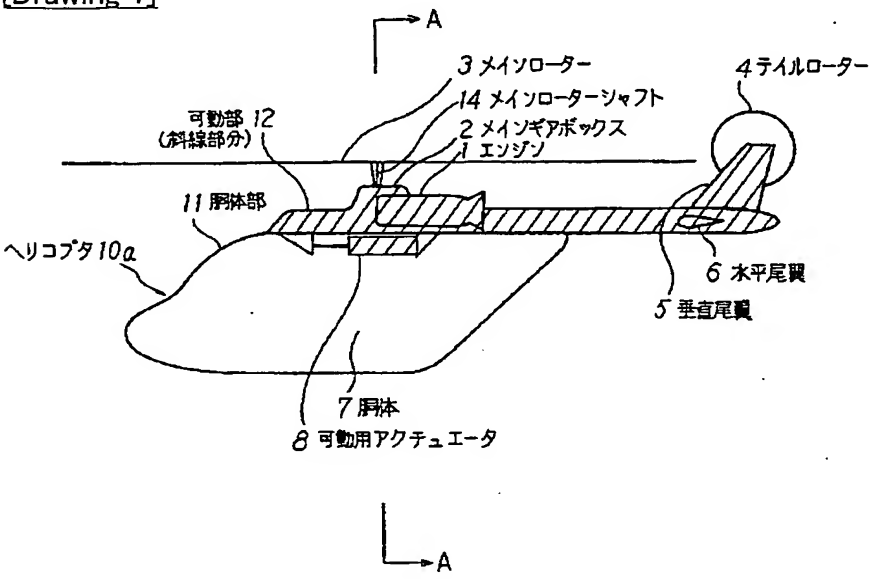
damages caused by the use of this translation.

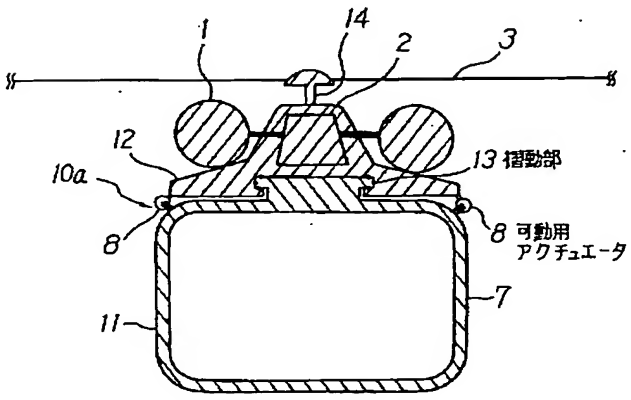
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

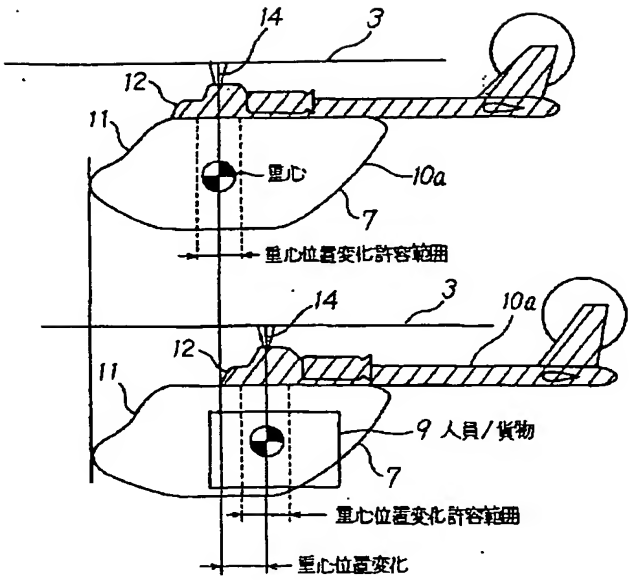
[Drawing 1]



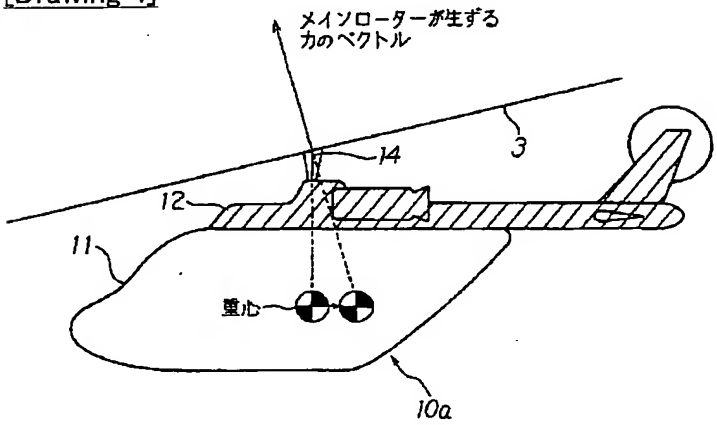
[Drawing 2]



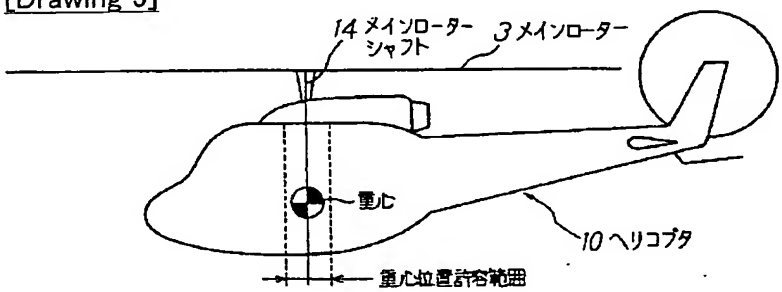
[Drawing 3]



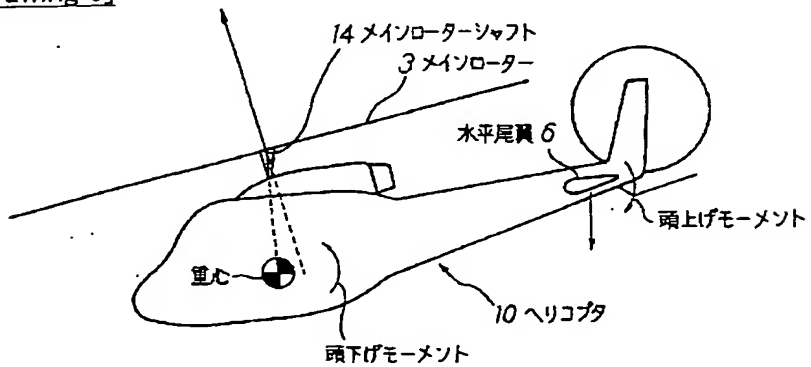
[Drawing 4]



[Drawing 5]



[Drawing 6]



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